

# CONCEPTUAL DEVELOPMENT AND MONITORING PLAN

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## MARICOPA SUN SOLAR COMPLEX PROJECT, KERN COUNTY, CALIFORNIA

November 2014

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Quad Knopf

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## Maricopa Sun Solar Complex Project, Kern County, California

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# 1.0 INTRODUCTION

## 1.1 Purpose

This conceptual development and monitoring plan (conceptual plan) describes the activities and associated biological monitoring that would be performed during the installation of a typical 160-acre, 20 megawatt (MW) solar photovoltaic (PV) facility within the Maricopa Sun Solar Complex (Figures 1 through 3). As such, it provides a basis for comparison with biological monitoring requirements implemented on other solar projects in the region, and is the basis for the cost analysis of biological monitoring associated with the implementation of the Maricopa Sun, LLC Habitat Conservation Plan (MSHCP).

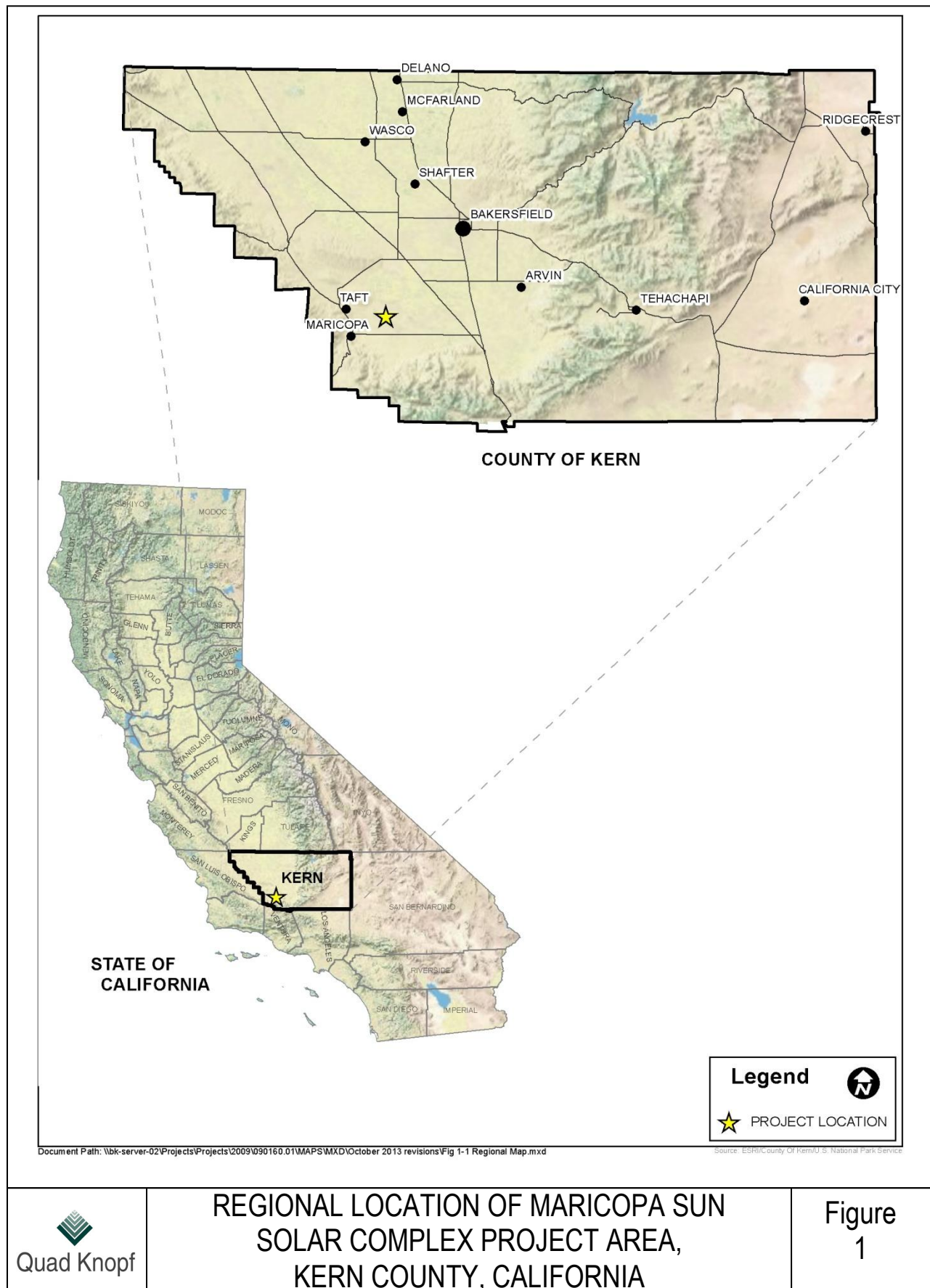
The activities discussed under this conceptual plan (project activities) fall within the scope of the pre-construction and construction activities listed as Covered Activities in the MSHCP (Chapter 2, Section 2.3). Despite those activities being well defined in the MSHCP, they are defined in this document as needed to establish the level of biological monitoring required under this conceptual plan.

## 1.2 Project Overview and Location

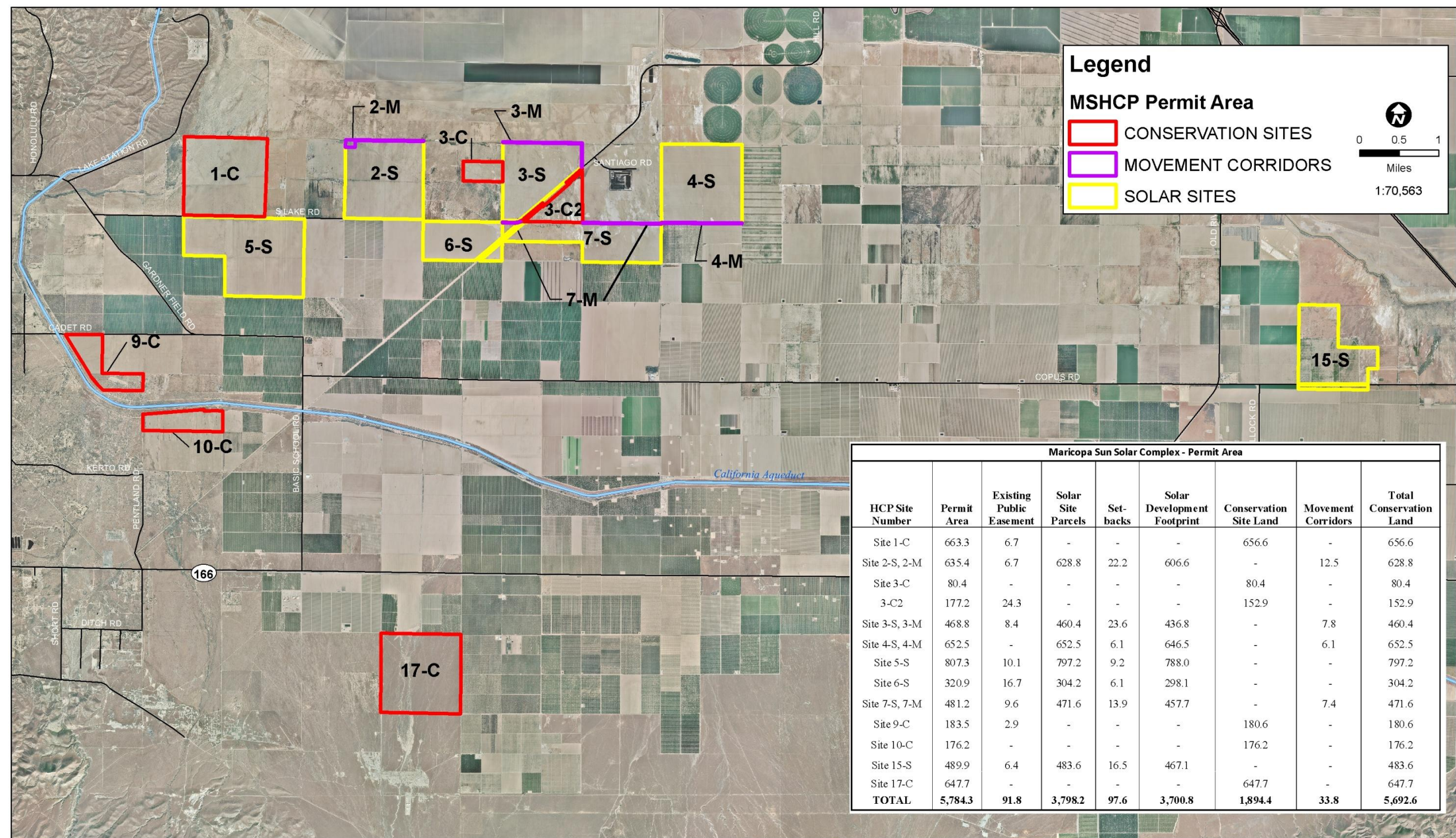
Maricopa Sun, LLC (Project Administrator) is administering the development of a solar complex in southern Kern County, California (see Figure 1) and individual solar developers will be implementing the terms of the MSHCP. The project consists of seven Solar Sites that total 3,798.3 acres located within southwestern Kern County, California, approximately three miles northeast of the unincorporated community of Maricopa (see Figure 2, Table 1).

**Table 1**  
**Maricopa Sun Solar Complex: Solar Sites**

HCP Site Number	APN	Township, Range	Solar Site Parcels (acres)
Site 2-S	220-120-(18-19)	T.32S., R.25E., Sec.21 <sup>1</sup>	628.8
Site 3-S	220-110-08	T.32S., R.25E., Sec.23 <sup>1</sup>	460.4
Site 4-S	295-040-(30-31)	T.32S., R.26E., Sec.19 <sup>1</sup>	652.5
Site 5-S	220-170-(01-02,05,07)	T.32S., R.25E., Sec.29 & 30 <sup>1</sup>	797.2
Site 6-S	220-130-01	T.32S., R.25E., Sec.27 <sup>1</sup>	304.2
Site 7-S	220-130-(02,12)	T.32S., R.25E., Sec.25&26 <sup>1</sup>	471.6
Site 15-S	295-130-25	T.32S., R.27E., Sec.33 <sup>1</sup>	483.6
<b>TOTAL</b>			<b>3,798.3</b>







Maricopa Sun Solar Complex - Permit Area								
HCP Site Number	Permit Area	Existing Public Easement	Solar Site Parcels	Set-backs	Solar Development Footprint	Conservation Site Land	Movement Corridors	Total Conservation Land
Site 1-C	663.3	6.7	-	-	-	656.6	-	656.6
Site 2-S, 2-M	635.4	6.7	628.8	22.2	606.6	-	12.5	628.8
Site 3-C	80.4	-	-	-	-	80.4	-	80.4
3-C2	177.2	24.3	-	-	-	152.9	-	152.9
Site 3-S, 3-M	468.8	8.4	460.4	23.6	436.8	-	7.8	460.4
Site 4-S, 4-M	652.5	-	652.5	6.1	646.5	-	6.1	652.5
Site 5-S	807.3	10.1	797.2	9.2	788.0	-	-	797.2
Site 6-S	320.9	16.7	304.2	6.1	298.1	-	-	304.2
Site 7-S, 7-M	481.2	9.6	471.6	13.9	457.7	-	7.4	471.6
Site 9-C	183.5	2.9	-	-	-	180.6	-	180.6
Site 10-C	176.2	-	-	-	-	176.2	-	176.2
Site 15-S	489.9	6.4	483.6	16.5	467.1	-	-	483.6
Site 17-C	647.7	-	-	-	-	647.7	-	647.7
<b>TOTAL</b>	<b>5,784.3</b>	<b>91.8</b>	<b>3,798.2</b>	<b>97.6</b>	<b>3,700.8</b>	<b>1,894.4</b>	<b>33.8</b>	<b>5,692.6</b>

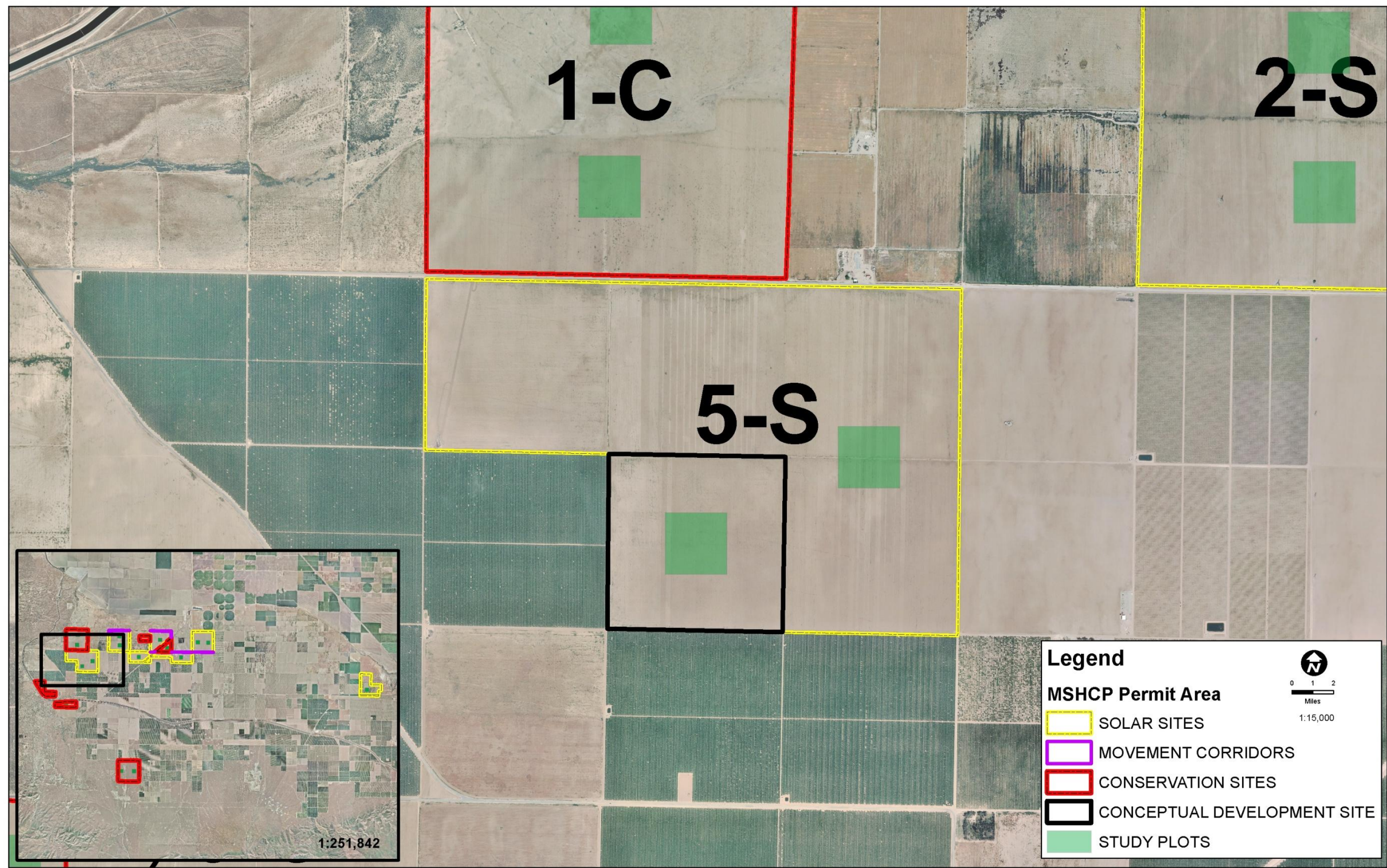
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SITE PLAN  
MARICOPA SUN SOLAR COMPLEX, KERN COUNTY, CALIFORNIA

Figure  
2





Time: 3:14:19 PM Date: 11/6/2013 Document Path: \\bk-server-02\Projects\Projects\2009\090160.01\MAPS\MXD\October 2013 revisions\Fig 3 - Conceptual Development Site.mxd



EXAMPLE LOCATION OF DEVELOPMENT SITE, KERN COUNTY, CALIFORNIA

Figure  
3



Complete development of a 160-acre parcel will produce an expected 20 MW of clean electricity. Solar facilities will be constructed on property owned by (i) an independent solar developer (Developers) or its affiliates or financing parties or (ii) affiliates of Project Administrator and leased or otherwise made available to a Developer. The Project Administrator will require Developers to comply with the terms and conditions of the federal Section 10(a)(1)(B) ITP outlined in the MSHCP. The Project Administrator will require Developers to provide biological monitoring to determine the effects of the MSHCP, effectiveness of the MSHCP, and for monitoring and reporting of compliance with all terms and conditions of the MSHCP.

Studies and monitoring associated with the interim and long-term habitat management of the Conservation Sites are not included in this plan. Details associated with habitat management and enhancements are addressed in the Interim and Long-term Habitat Management Plans of the MSHCP (Appendix C). This document describes the level of biological monitoring that would be conducted to track compliance with the project's minimization, avoidance, and mitigation measures, to identify actual levels of impact from project activities; and is meant to summarize and augment the information included in Chapter 6 of the MSHCP.

The activities described below represent a typical solar development plan on a 160-acre project site, but this plan will not necessarily be adopted by all solar developers involved in the Maricopa Sun Solar Complex Project. Accordingly, this is a conceptual plan and the monitoring that would be required on any given development will be adjusted as needed to account for changes in development practices. The section below provides a summary of the activities to be performed, an estimated duration of those activities, and an estimate of the level of monitoring required based on the duration of those activities.

## **2.0 DEVELOPMENT AND MONITORING PLAN DESCRIPTION**

Development activities and associated biological monitoring for a conceptual 160-acre solar facility are identified by project phase below. The solar development project includes pre-construction and construction phases, and associated biological monitoring tasks include pre-construction surveys and biological monitoring of development activities. Pre-construction activities (Chapter 2, Section 2.3.1) include those activities that will be performed to prepare the site for construction, and construction activities (Chapter 2, Section 2.3.2) are those activities that will be performed to build the solar arrays and associated infrastructure necessary for commissioning and interconnection. Prior to any pre-construction or construction activity, pre-construction biological surveys (Chapter 2, Section 2.3.5) will be conducted to assess biological resources occurring in and around the 160-acre solar development site. Compliance monitoring will accompany all pre-construction and construction activities throughout the duration of the project.

### **2.1 *Pre-construction Biological Surveys***

Prior to any work being performed on a project site, pre-construction surveys (Chapter 2, Section 2.3.5) will be conducted to determine whether covered species are present, and to determine where any exclusionary fencing for Environmentally Sensitive Areas (ESA) might be necessary.



These surveys will be conducted within 14 days prior to construction, and will be performed in a manner that provides 100 percent coverage of the 160-acre site. An additional pre-construction survey will be required before work can resume if a break in work occurs for a period of 14 days or more. Given the level of activity throughout the project site, no additional pre-construction surveys are expected to be needed.

### **2.1.1 DURATION OF ACTIVITY**

A pre-construction survey of the entire 160-acre site can be accomplished in a single day or less. Pre-construction surveys are projected to take approximately 16 person-hours to complete.

### **2.1.2 LEVEL OF MONITORING**

A single pre-construction survey of a 160-acre project site would require approximately 16 hours, assuming that 27, 0.5-mile long transects spaced at intervals of approximately 100 feet would be surveyed. Four biologists could conduct a pre-construction survey in approximately four hours assuming no observations or other issues arose that required additional time to assess.

## **2.2 Pre-construction Activities**

The pre-construction phase encompasses all activities associated with preparation of the project site for development of the solar facilities. These activities will encompass the entire 160-acre project site. The pre-construction phase will involve up to six pieces of heavy equipment and eight people working throughout the project site to complete all activities within the development schedule. Pre-construction activities include, but are not limited to: civil sitework, and site grading and compacting, demarcating the Solar Development Footprint, establishing and maintaining staging areas, installing fencing, gates, and parking areas (including installing signage), installing retention basins, and establishing access roads and the construction management trailer staging area.

Civil sitework, and site grading and compacting will include surveying and staking, clearing, grading, leveling, and compacting, and demarcation of the Solar Development Footprint. Site surveys will be performed to locate various property corners and property boundaries, and to complete topographic and elevation mapping. Surveying will also be needed to establish locations of solar arrays, fencing, underground conduits, and other components of the project.

Minimal site grading is anticipated, but will be dependent upon specific topographic conditions determined by site surveys. After completion of grading, a relatively level, compacted surface will be provided for the project site using ring rollers and other vehicle compaction techniques. During grading and compaction activities, water trucks (using non-potable water) will be in continuous operation to minimize airborne particles and dust. At any one time during grading, six pieces of heavy equipment may be in use.

The Solar Development Footprint will be designated by establishing fenced avoidance areas between the project site that will be under construction, and lands that will not undergo construction. These barrier fences will be established to keep construction activities confined to

the project disturbance area and to minimize potential impacts to surrounding native habitat. Temporary construction fencing will consist of T-post type structural members with ropes and flagging located greater than one foot above the ground. Alternatively, standard construction fencing consisting of orange plastic webbed fencing material may be used. The installation of this fencing will require setbacks of various distances at some locations, such as mandatory 50-foot setbacks from existing public easements. It is anticipated that all perimeters of the project site will need to be fenced at some point during construction. Trucks, forklifts, and other equipment may be used to deliver and distribute fencing and materials to the various locations within the project site.

During the pre-construction phase of the solar development, a staging area (i.e., laydown yard and trailer area) will be established that will not exceed 5 acres and that will be inside of the Solar Development Footprint. The staging area will not be fenced or paved. Materials delivered to the project site will initially be stored at the staging area before being distributed to where they will be used. The staging area will be used throughout the construction phase and will then be replaced with solar arrays when no longer needed. Vehicle tire grates, straw bales, and construction demarcation fencing will be installed prior to construction, and as necessary, at entrances to the staging areas to ensure compliance with environmental protection measures (e.g., Storm Water Pollution Prevention Plan [SWPPP]). The access roadbed to the staging areas will be 20 feet wide and consist of compacted earth surfaced with gravel or compacted soil. The access roadway is anticipated to be relatively short, approximately 0.25 miles, because the staging area will be placed as close to existing paved access roads as possible.

The project perimeters will be secured with chain-link perimeter security fencing with barbed wire along the top, for a total height of eight feet. The base of the fencing will be elevated six inches and will be knuckled (wrapped back to form a smooth edge) to be safely permeable to wildlife species. The fencing will remain in place during the operations and maintenance phase to provide security. Installation of parking areas for construction workers will be within the Solar Development Footprint. Parking areas may be transitioned from temporary dirt parking areas during the initial start of the pre-construction phase, to the staging areas once materials and equipment use provides parking space within the staging areas. It is anticipated that no more than one acre will be needed for parking on each site during the pre-construction phase, and that no more than two acres of temporary parking areas will be needed during the construction phase. The paved staging areas will be used for parking during other project phases.

The installation of retention basins is not listed as part of the Covered Activities, but instead is detailed in the Preservation, Enhancement, Minimization, Avoidance, and Mitigation measures in Chapter 2, Section 2.3.5 of the MSHCP. Retention basins are an element of the SWPPP best management practices (BMPs) and will serve as a measure to intercept excess runoff from the construction areas.

A 12-foot-wide by 60-foot-long access driveway/approach to the project site will connect to the site's parking lot, equipment areas, the area used for the construction management trailer, shipping and receiving areas, and/or storage and staging areas. Roadways will consist of compacted earth suitable to support heavy haul traffic and will be equipped with gravel pads or



other approved methods of minimizing trackout at the project site entrance. Access roads will not be paved.

### **2.2.1 DURATION OF ACTIVITIES**

The pre-construction phase will last approximately 60 days, with activities beginning and ending at various intervals within that time frame. The general time frame for civil sitework and site grading is approximately 40 days, and will involve surveying and staking, clearing, grading, leveling and compacting, and demarcation of the Solar Development Footprint. The civil sitework and site grading will be accomplished within the first two months of project development. A materials and equipment staging area will be established within the first two weeks after commencement of the project, once the project site has been compacted and survey crews have demarcated the location and perimeter.

The installation of perimeter fencing, gates, and parking areas will be conducted within the first two months of the project, and is expected to take approximately 30 days. Fencing, gates, and parking areas will be installed concurrently with other pre-construction activities such as civil sitework and site grading. Signs will be installed concurrently with the fencing, and signs will be placed on fencing when possible.

One or more retention basins will be installed within the first month of the project within the scope of civil work and site grading. Retentions basins will take approximately 10 days to construct. Within the last two weeks of the pre-construction phase, access roads and a construction management trailer staging area will be installed, which is projected to take approximately 10 days.

### **2.2.2 LEVEL OF MONITORING**

The majority of pre-construction activities will occur over all 160 acres of the project site and the site perimeter. These activities are expected to involve up to six pieces of heavy equipment, and eight construction personnel and their associated light transportation vehicles. No more than 30 minutes prior to the start of work, biological monitors will conduct pre-activity clearance sweeps of the project site to ensure no Covered Species, or other federally- or state-listed species, are present and to ensure all required SWPPP BMPs are correctly installed. Biological monitors will coordinate with construction foremen to determine where to begin pre-activity sweeps so as to efficiently pair sweeps with the schedule of work activities.

Given the flat, square nature of the project site, one biological monitor will be able to efficiently observe a 40-acre portion of land and the associated activities occurring on that land. For a 160-acre solar project, the entire project site can be efficiently monitored by four biological monitors. Biological monitors will walk the project site perimeters, and using binoculars, they will survey the sites from the viewing vantage of their pick-up truck beds. Because fence installation will occur along the perimeter of the project site where Covered Species are most likely to be encountered, a biological monitor will directly monitor the activity. All other pre-construction activities will be monitored from the site perimeter or from within the site when safe to do so, and always from locations that are out of the way of work crews.

Once work activities have been completed for the day, biological monitors will conduct post-activity sweeps of the entire 160-acre project site to ensure the site is free of hazardous and non-hazardous waste and to ensure all SWPPP BMPs have been correctly replaced and are in good repair. Post-activity sweeps will be conducted prior to work crews leaving the project site at the end of the day, so that any necessary remedial actions can be dealt with immediately.

## **2.3 Delivery and Storage of Materials and Equipment**

Construction materials, including concrete, pipe, wire, cable, fuels, reinforcing steel, and small tools and consumables, will be delivered to the work sites by truck. Photovoltaic modules, trackers, foundation posts (I-Beams), inverters, transformers, HV gear, and combiner boxes for the solar facilities will be manufactured off site, and will be delivered by heavy-haul truck. The delivery of all materials is limited to the access roads and staging area, and will require up to eight pieces of small equipment (e.g. forklifts) and four people to unload and store. The distribution of materials and equipment for the construction phase will occur throughout the 160-acre project site, as necessary for associated activities.

### **2.3.1 DURATION OF ACTIVITY**

The delivery and storage of materials and equipment is expected to take approximately 100 days and will begin concurrently with the civil site-work activities during pre-construction. Delivery of materials will continue into the construction phase. The distribution of materials and equipment to different regions of the project site will occur concurrently with activities that require such materials throughout the life of the project.

### **2.3.2 LEVEL OF MONITORING**

Because the delivery and storage of materials will overlap with pre-construction and construction activities, and falls within the scope of construction monitoring, no additional biological monitors will be required to monitor the delivery, storage, and distribution of materials throughout the project site. Biological monitors will conduct pre-activity sweeps of the access roads and staging areas to ensure those areas are free of Covered Species. During monitoring of pre-construction and construction activities, biological monitors will be responsible for monitoring the delivery and distribution of materials.

## **2.4 Construction Activities**

The construction phase encompasses all activities associated with construction of solar arrays and associated facilities necessary for commissioning. These activities are divided into mechanical and electrical activities. Mechanical activities include installation of foundation poles and assembly of solar arrays (vertical beam mounting, horizontal beam installation, and drive station installation). Solar fields will be constructed using the latest technology available and will consist of either crystalline silicon or thin film PV (including concentrated PV) technology on tilted or horizontal single-axis trackers. The PV modules would be mounted south-facing and tilted about 15 to 25 degrees from horizontal. Tilted tracker units would be arranged in east/west-



oriented rows and be self tracking or connected by drive shafts to drive motors that rotate the solar panels from east to west to follow the sun throughout the day. Drive motors will be located approximately every 1,200 feet along each east/west row and will be mounted on small concrete foundations, approximately 8 feet by 12 feet in area and approximately 2 feet thick.

The highest point on the tilted tracker units (the uppermost solar panel) will be approximately 10 feet above the ground when at maximum tilt. The units will be mounted using embedded foundations (i.e., piles, driven piers, or screw-type foundations) to support the trackers. Approximately 60,000 pile insertions are anticipated. The foundations will be located at the foot of each tracker unit. The embedded foundations will be approximately 4.5 inches to 12 inches in diameter and up to 15 feet deep. The concrete electrical equipment pads that support the inverters would be approximately 15 feet by 20 feet.

Electrical activities include trenching, conduit installation, cable pulls, and installation of associated electrical infrastructure (installation of inverter pad foundations, installation of inverters, and installation of transformers, combiner box mounting, photovoltaic module installation, module string wire connections, and HV contractor works). The electrical conduit from each solar panel will deliver DC power along an underground trench to the inverters located on the electrical equipment pads. Conduit trenching will be approximately 6 to 10 feet deep and 14 inches wide. Inverters will convert the DC power to AC, which will then be stepped up to medium voltage via medium voltage transformers. The medium voltage transformers will deliver power along an underground collection system to the on-site project substation, and the power will be stepped up from there for interconnection to the electrical grid at the electrical transmission corridors.

Poles for AC collection and distribution systems will include layout, drilling, installing, and backfilling posts. Trucks, cranes, drills, and other heavy line equipment will be utilized to install the new structures. Approximately 300 feet of overhead lines will be needed to connect the on-site substation to the existing off-site transmission line grid. The project substation will occupy an area measuring approximately 150 feet by 150 feet along the southwestern edge of the project site. The substation will be fenced with wildlife impermeable fencing. All electrical conduit and transformers will be fully insulated and covered with weather protection material. The tallest part of the substation will reach a height of approximately 60 feet, and no more than two pole assemblies will be needed to interconnect on-site facilities to the existing transmission grid.

It is estimated that 24 pieces of equipment will be utilized for the construction phase including, but not necessarily limited to: excavators, graders, lightweight trucks, dump trucks, flatbed trucks, support pickups, water trucks, concrete trucks, forklifts, end loaders, cranes, truck-mounted post hole augers, line trucks with air compressors, scrapers, motor graders, backhoe/loaders, truck mounted cranes, dozers, grade-all, pad drum vibratory rollers, conductor reel and pole trailers, bucket trucks, truck-mounted tensioners, and pullers and trenchers.

#### **2.4.1 DURATION OF ACTIVITY**

Construction activities are projected to take approximately 157 days to complete. Although both mechanical and electrical activities required to commission the solar site begin concurrently, the

activities associated with mechanical work will require 75 days within the first three months to complete, while electrical activities will require approximately 150 days. Construction of the solar facility will be phased to occur on 40-acre quarters of the project site at a time, with crews rotating around the 160-acre project site as tasks are completed. The number of personnel working within the project site will vary from 40 at the start of construction up to 160 at the peak, amounting to approximately 40 construction personnel per 40-acre quarter. After the peak of the construction phase, occurring approximately around month four, the number of people working on site will taper off at roughly the same ratio of 40 people per 40-acre quarter.

## **2.4.2 LEVEL OF MONITORING**

As with pre-construction surveys, pre- and post-activity sweeps will be required throughout the project site during construction activities. No increase in biological monitors will be required, because all construction activities will occur within the same footprint (Solar Development Footprint) as pre-construction phase activities. The maximum amount of monitoring required for work occurring within the 160-acre project site will be four biological monitors, with each biological monitor being generally responsible for a 40-acre quarter of the project site. Biological monitors may not be specifically tied to a particular 40-acre portion of the project site if construction activities are intensified in one area and slacken in another. More than one biological monitor may accompany crews in areas of intensified work levels.

## **2.5 Extrapolation to Other Solar Projects**

This conceptual monitoring plan pertains to a single 160-acre solar project in the Maricopa Sun Solar Complex. For a project of this size, four biological monitors will be able to efficiently and effectively monitor the project at a ratio of one biological monitor per 40 acres. The ratio of one biological monitor per 40 acres will be maintained in the event that a solar development occurs over at a larger scale. For example, a solar development occurring on 320 acres will require a total of eight full-time biological monitors to carry out pre-construction surveys, pre- and post-activity sweeps, and to efficiently monitor pre-construction and construction activities. Additionally, in the event Covered Species increase in abundance on or around a project site, it may become necessary to increase the level of biological monitoring to ensure no lethal take of species occurs. Increased abundance of Covered Species will trigger the need for additional ESA buffers and additional biological monitors stationed in the vicinity of the ESA to monitor project-related impact levels (see Chapter 4 for detailed project impacts analysis).